Status of the Run IIb DZero Detector Project

- Status overview
- Personnel updates
- Technical highlights
- Project tracking, performance status
- Accelerator issues
- Next six months
- Conclusions

Jon Kotcher
DZero Collaboration Meeting
February 12, 2003

Status Overview

- R&D has been provided to keep projects on track, advance prototyping
  - NSF MRI, In-kind also very helpful
- Full approval from DOE is required for spending on major items of equipment: i.e., moving into production, which we are well ready for
  - Final detector elements
    - Silicon sensors, hybrids, final trigger PC boards, etc.
  - Major outlays for labor at FNAL, universities
- DOE (Lehman) Review recommended baselining in September '02
- Approval from ESAAB (DOE Associate Director of HENP) in December '02
- **Approval granted last Friday, 2/7, 14:47 EST for full spending authority in FY03 (AEP, Under-Secretary of Energy) – last hurdle**
  - First large procurement: sensors, ~ $1.5M in March
- Further approval (FY04 and beyond) dependent on outcome of:
  - P5 Review (mtg on March 26-27 at Fermilab, report in June '03)
  - DOE (Lehman) Review of Run IIb Detector Projects (CD-3b, ~ May '03)
  - DOE Review of Accelerator, full project plan through FY06 presented (July '03)

Run IIb Personnel Changes

- George Ginther is new silicon co-leader
  - Joins Marcel Demarteau on March 1
  - Alice Bean, silicon Deputy since summer '01, moved back to Kansas summer '02
    - Many thanks to Alice for helping to design a beautiful detector, putting together a solid project plan
    - An instrumental player during a new, difficult period
  - George brings much technical experience, expertise to the table – very glad to have him
    - A major investment by the collaboration in IIb program, as must occur…
- Eckhard von Toerne (Kansas State) to co-lead silicon electronics effort with Andre Nomerotski
  - Replaces Bill Reay (retired)
  - A very important position, has gotten off to a very fine start
- Arisara Amorn-Vichet is new Budget Officer
  - Colleen Yoshikawa laid the groundwork, helped us through the (initial) review wars, returning to PPD - thank you!
- Plenary speakers this Collaboration Meeting
  - Kurt Krempetz – Run IIb Silicon Mechanical Design (10:30 AM Friday)
  - Kazu Hanagaki – The SVX4 Chip (11:45 AM Friday)
  - Both represent significant technical challenges, have been major success stories

Run IIb Project Organization

DØ Run IIb Project
J. Kotcher, Project Manager
R. Partridge, Deputy; V. O'Dell, Associate; W. Freeman, Assistant
M. Johnson, Technical Coordinator
A. Amorn-Vichet, Budget Officer; T. Erickson, Administration

WBS 1.1 Silicon
M. Demarteau
G. Ginther

- 1.1.1 Sensors — R. Demina, F. Lehner
- 1.1.2 Readout System — A. Nomerotski, E. von Toerne
- 1.1.3, 1.1.5 Mechanics & Assembly — W. Cooper, K. Krempetz
- 1.1.4 Production — J. Fast
- 1.1.4 QA, Testing, & Burn-in — C. Gerber
- 1.1.6 Monitoring — M. Corcoran, S. de Jong
- 1.1.7 Software & Simulation — F. Rizatdinova, L Shabalina
- 1.1.8 Administration (M. Demarteau)

WBS 1.2 Trigger
H. Evans
D. Wood

- 1.2.1 L1 Cal Upgrade — M. Abolins, (H. Evans), P. LeDu
- 1.2.2 L1 Cal/Track Match — K. Johns
- 1.2.3 L1 Track Trigger — M. Narain
- 1.2.4 L2β Upgrade — R. Hirosky
- 1.2.5 Silicon Track Trigger — U. Heintz
- 1.2.6 Simulation — M. Hildreth, E. Perez
- 1.2.7 Administration (D. Wood)

WBS 1.3 DAQ/Online
S. Fuess
P. Slattery

- 1.3.1 Level 3 Systems — D. Chapin, G. Watts
- 1.3.2 Network & Host Systems — J. Fitzmaurice, S. Krzywdzinski
- 1.3.3 Control Systems — F. Bartlett, G. Savage, V. Sirotenko
- 1.3.4 DAQ/Online Management (P. Slattery)

WBS 1.4 Project Administration

WBS 1.5 Installation
R. Smith

- 1.5.1 Silicon Installation — Mechanical: H. Lubatti; Electronics: L. Bagby, R. Sidwell
- 1.5.2 Trigger Installation — D. Edmunds

- George Ginther is new silicon co-leader
- Eckhard von Toerne is new silicon readout co-leader (replaces Bill Reay)
- Arisara Amorn-Vichet, new Budget Officer
- Kurt Krempetz, K. Hanagaki plenary speakers

Subproject Overviews

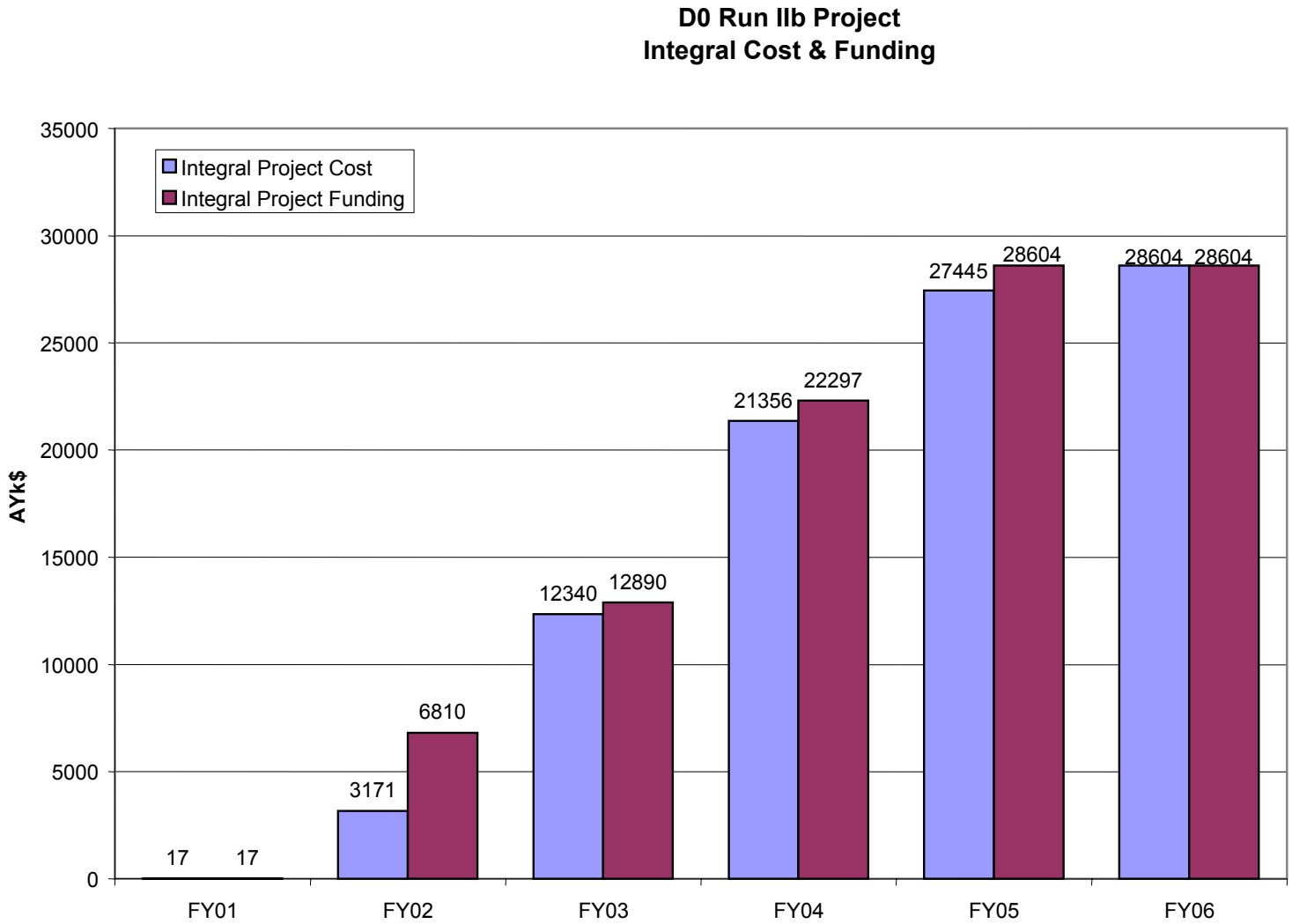
- WBS 1.1: Silicon Detector
  - Replace with more radiation-hard version, improved b-tagging capability
- WBS 1.2: Trigger Systems
  - Level 1: Shift some trigger functionality upstream to hardware level trigger
    - WBS 1.2.1, L1 Calorimeter Trigger
    - WBS 1.2.2, L1 Calorimeter/Track Match
    - WBS 1.2.3, L1 Central Track Trigger
  - Level 2: Incremental upgrades to Run IIa systems
    - WBS 1.2.4, L2 Beta System
    - WBS 1.2.5, L2 Silicon Track Trigger
- WBS 1.3: DAQ/Online System
  - Address need for enhanced filtering capability, higher bandwidth data logging
- WBS 1.4: Project Administration
  - Project personnel, travel, miscellaneous supplies
- WBS 1.5: Installation
  - Integration of silicon, trigger installation & pre-beam commissioning

DOE Level 1 Milestones

Milestone	DOE Level 1 Milestone Date
All silicon sensors delivered and tested	12/09/04
Online System Production and Testing Complete	10/07/05
Silicon stave production complete	12/22/05
Level 2 Trigger Production and Testing Complete	01/05/06
Level 1 Trigger Production and Testing Complete	01/10/06
Silicon ready to move to D0 Assembly Building	05/25/06

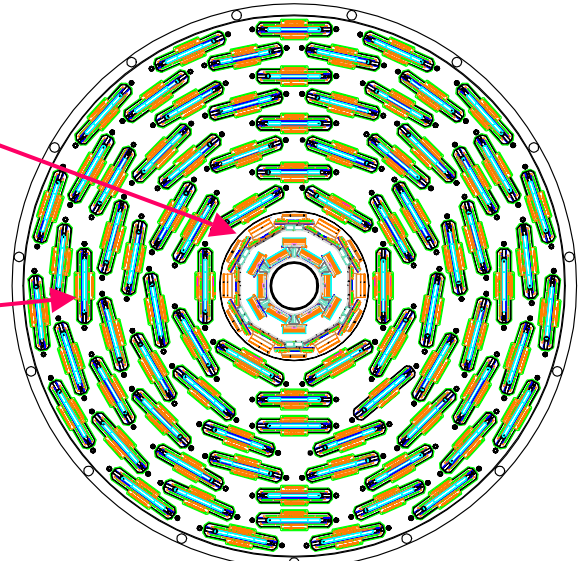
Shutdown begins March 30, 2006
Ready for beam October 25, 2006

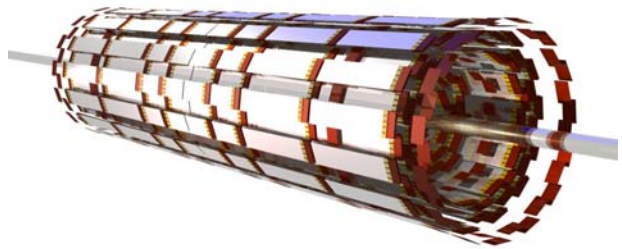
Integral Project Cost & Funding



WBS 1.1: Basic Silicon Design Choices

- Six layer silicon tracker, divided into two radial regions
  - Inner layers: Layers 0 and 1
    - Axial readout only
    - Mounted on integrated support
    - Assembled into one unit
    - Designed for V_{bias} up to 700 V
  - Outer layers: Layers 2-5
    - Axial and stereo readout
    - Stave support structure
    - Designed for V_{bias} up to 300 V
- Employ single sided silicon only, 3 sensor types
  - 2-chip wide for Layer 0
  - 3-chip wide for Layer 1
  - 5-chip wide for Layers 2-5
- No element supported from beampipe



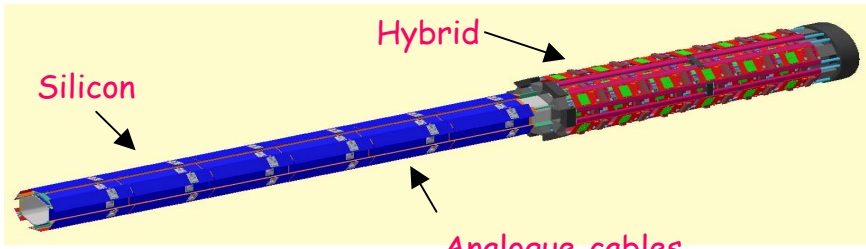


Silicon Layer 0 Support Structure

University of Washington

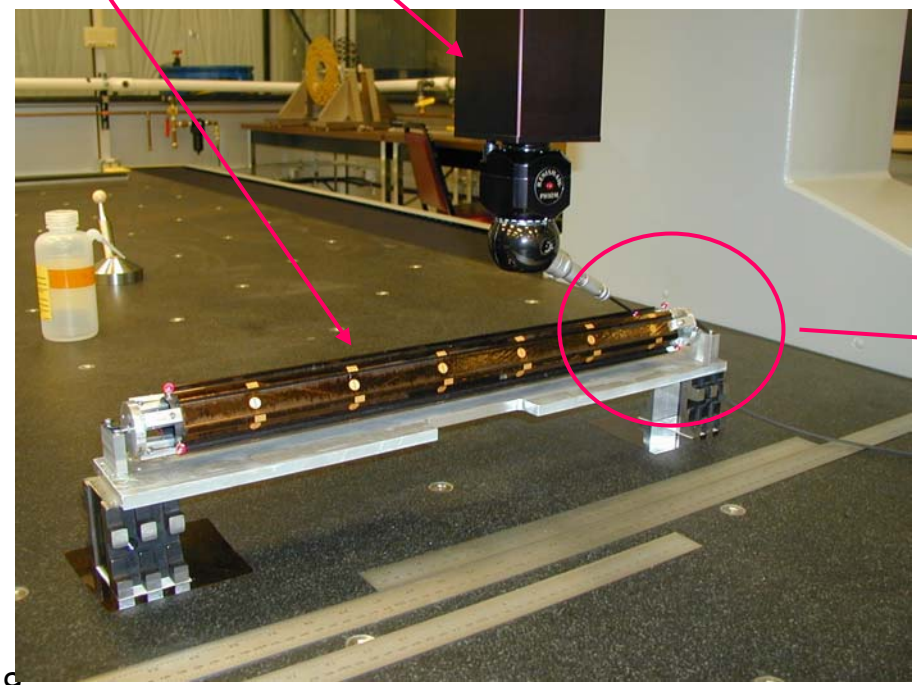
- First Layer 0 prototype carbon fiber support structure delivered to Fermilab for tests in January
- Integrated grounding – kapton/copper mesh
- Performs very well under deflection tests – major technical achievement

See Fri talk by K. Krempetz



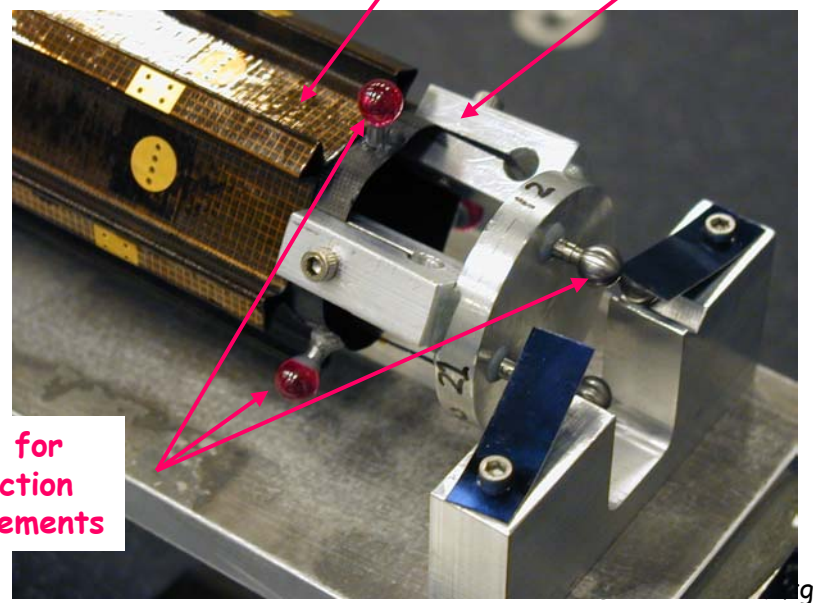
Mounted L0 structure

CMM head



Mounted L0 structure, ground mesh

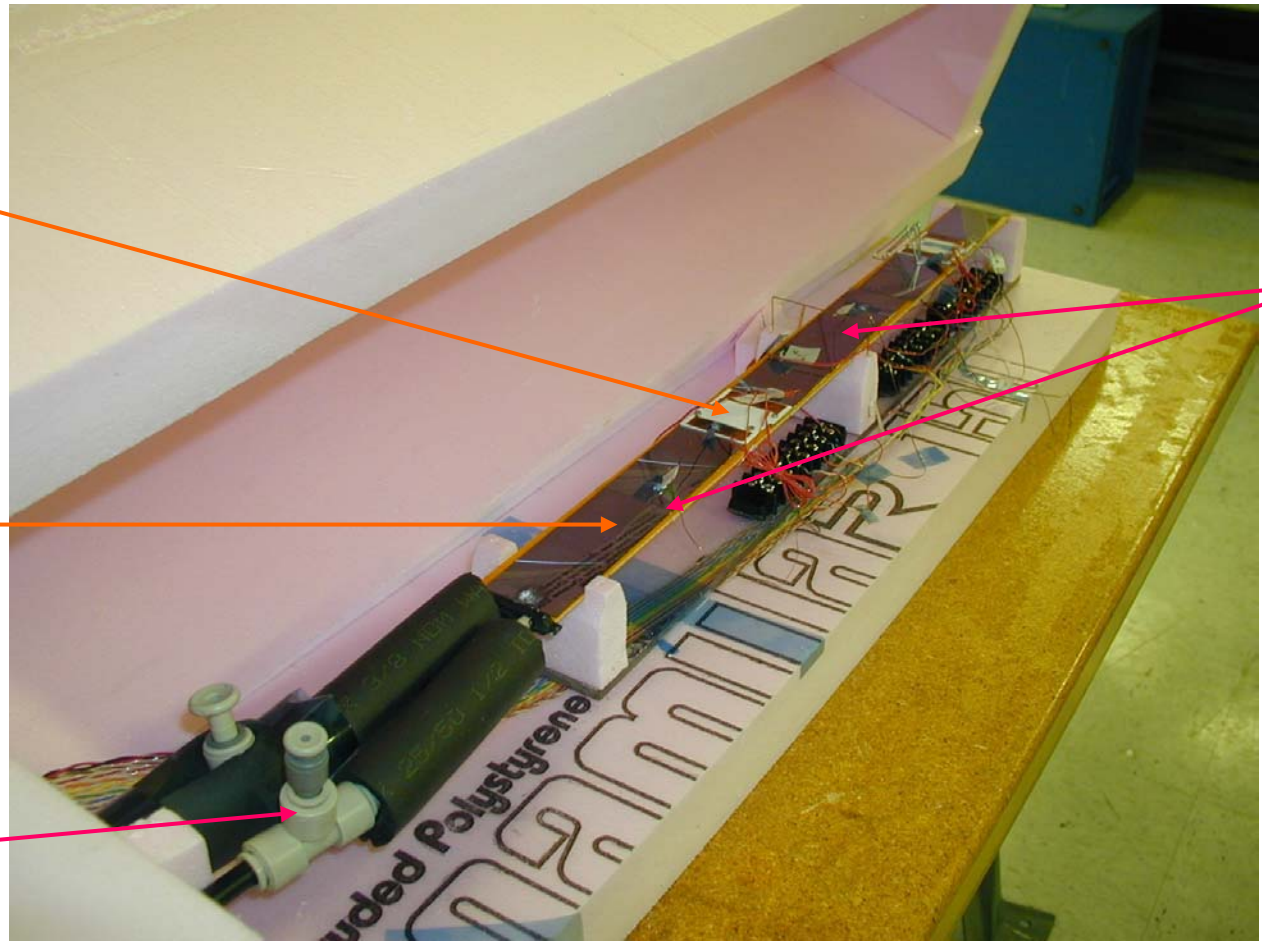
Clamps to inner carbon shell



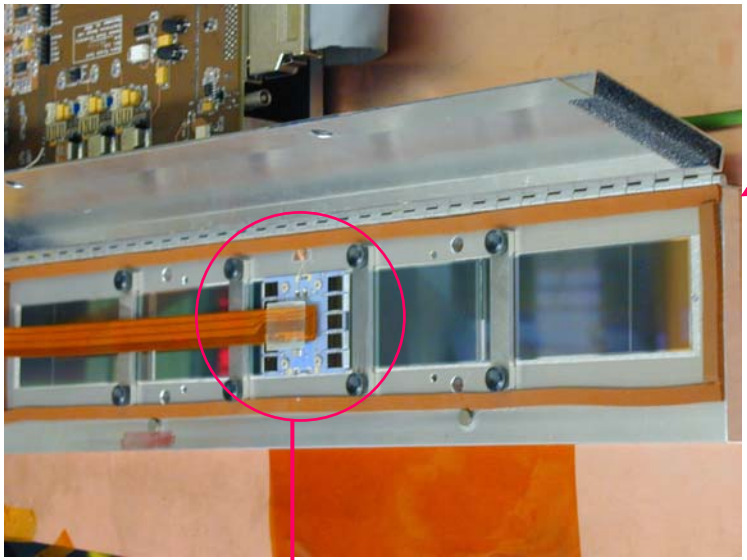
Balls for deflection measurements

Prototype Mechanical Stave

Prototype mechanical stave being thermally tested at SiDet
Dec 18 '02 integration milestone met

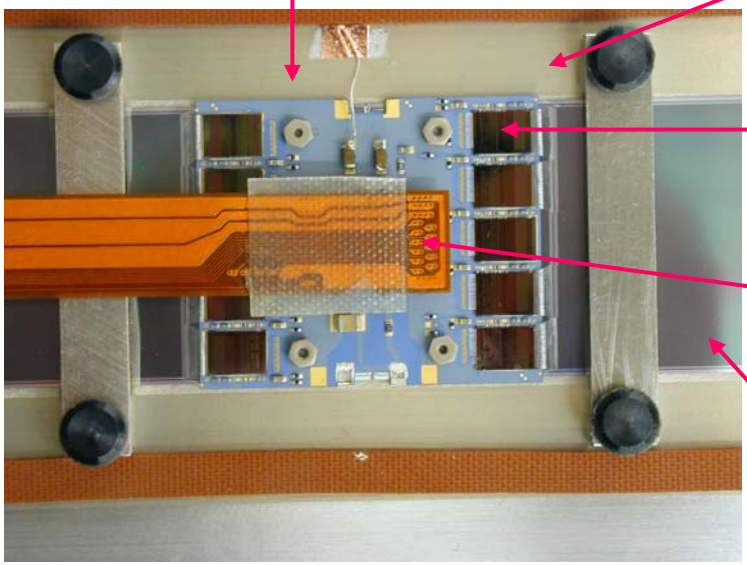


Outer Layer Silicon Module Prototypes



20/20 axial module

20/20 axial hybrid



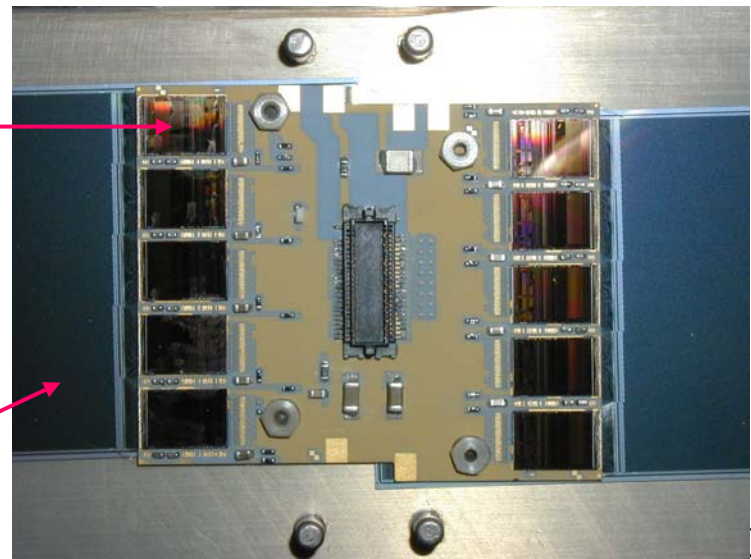
SVX4 readout chip

Digital cable

Silicon sensors

- First outer layer electrical-grade ("20/20") prototypes fabricated
- Two types: axial & stereo readout
- Each are 12 sensors long, ~100 mm in length
- Stereo angle obtained by rotating sensors
- Testing underway

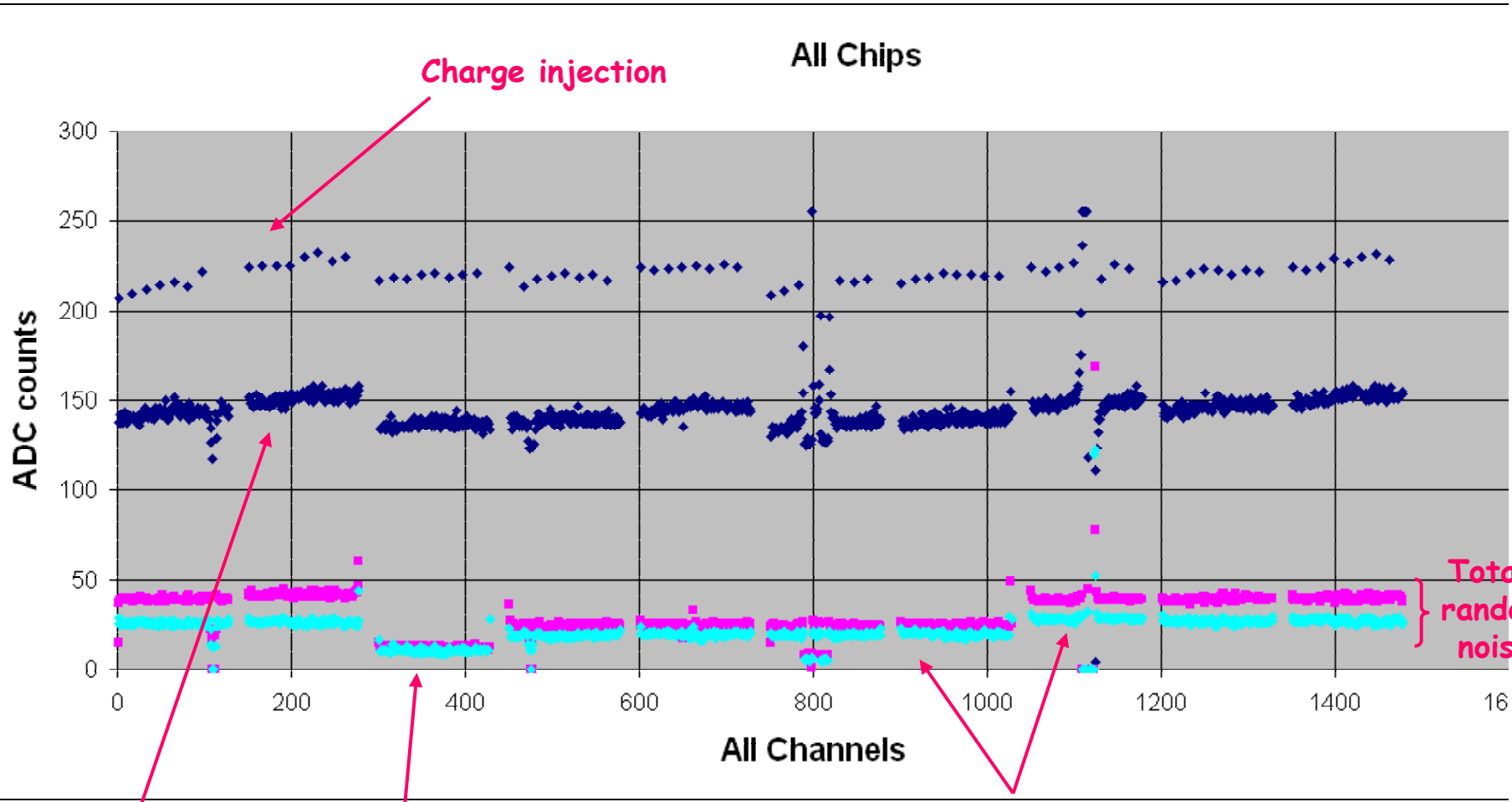
20/20 stereo hybrid



Module Test Results

See Fri talk by K. Hanagaki

Electrical tests of 20/20 axial module (10 chips)



Silicon Status

Component	Vendor	Design	First Prototype		Second Prototype	
			Ordered	Delivered	Ordered	Delivered
L0 Sensors	ELMA	✓	✓	✓		
	HPK	✓				
L1 Sensors	ELMA	✓	✓	✓		
	HPK	✓	✓	✓		
L2 Sensors	HPK	✓	✓	✓		
Analogue Cable	Dycx	✓	✓	✓	✓ ✓	✓ ✓
L0 Hybrid	Amitr.	✓	✓			
L1 Hybrid	CPT	✓	✓	✓		
L2A Hybrid	CPT	✓	✓	✓		
	Amitr.	✓	✓	✓		
L2S Hybrid	CPT	✓	✓	✓		
Digital Cable	Honey	✓	✓	✓	✓	✓
	Basic	✓	✓	✓	✓	✓
Junction Card		✓	✓	✓		
Twisted Pr. Cable		✓	✓	✓	✓	
Adapter Card		✓	✓	✓		
Purple Card		✓	✓	✓	✓	✓
Test Stand Elctr.		✓	✓	✓		

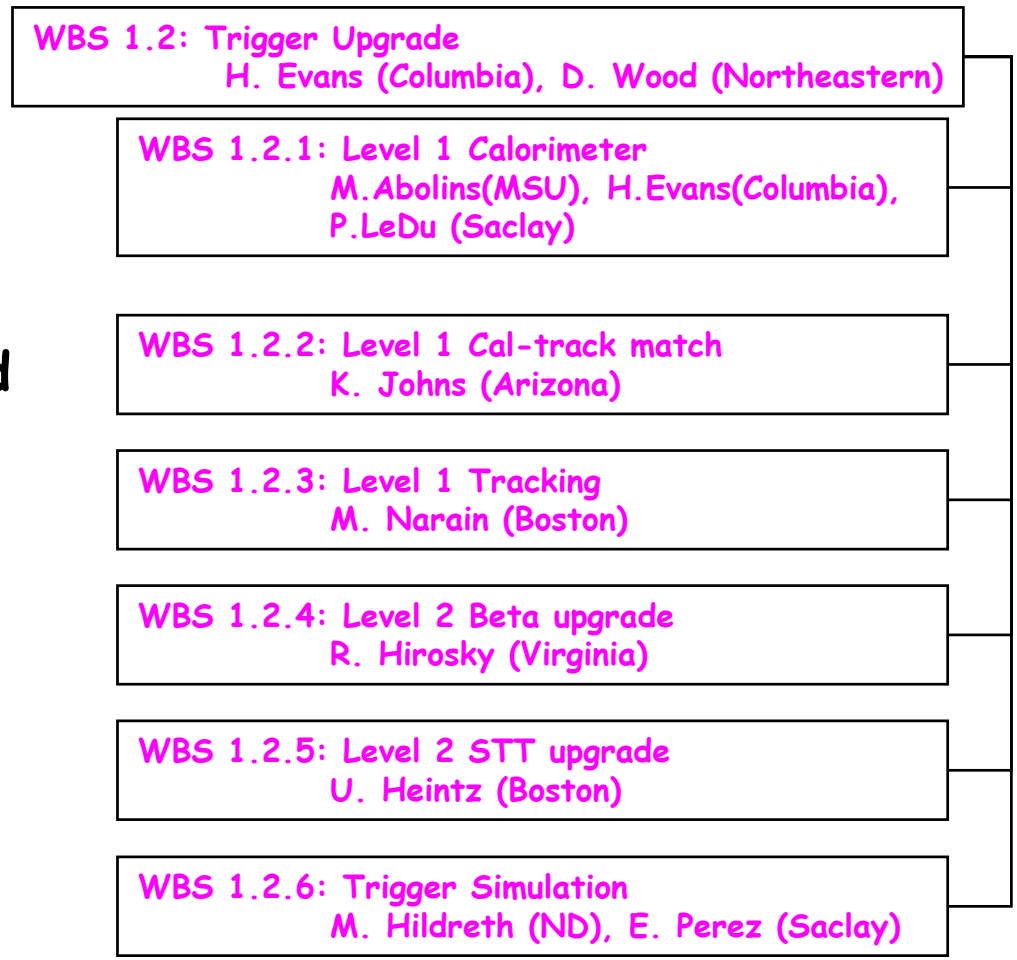
WBS 1.2: Trigger Upgrades

Level 1 projects underway

- Level 1 Calorimeter
- Level 1 Cal-track matching
- Level 1 Tracking
- Trigger simulations

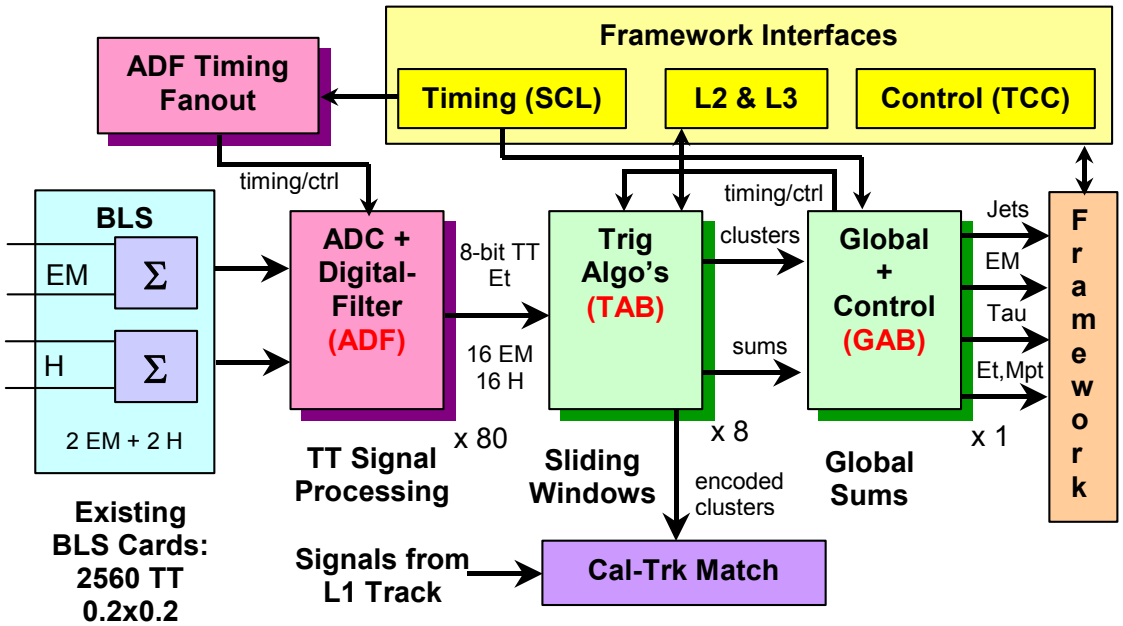
Level 2 projects (not discussed here)

- L2 Beta upgrade & STT upgrade
- Later start in schedule
- VTM's procured for STT (part of larger order)



WBS 1.2.1: Calorimeter Trigger Upgrade

- Saclay
  - ADC+Digital Filter (ADF)
  - ADF timing distribution board
  - Analog splitter (for in-situ tests)
  - ADF Crate/backplane
- Nevis
  - Trigger algorithm board (TAB)
  - Global Algorithm Board (GAB)
  - Crates for TAB/GAB
  - Test system for ADF-to-GAB cables

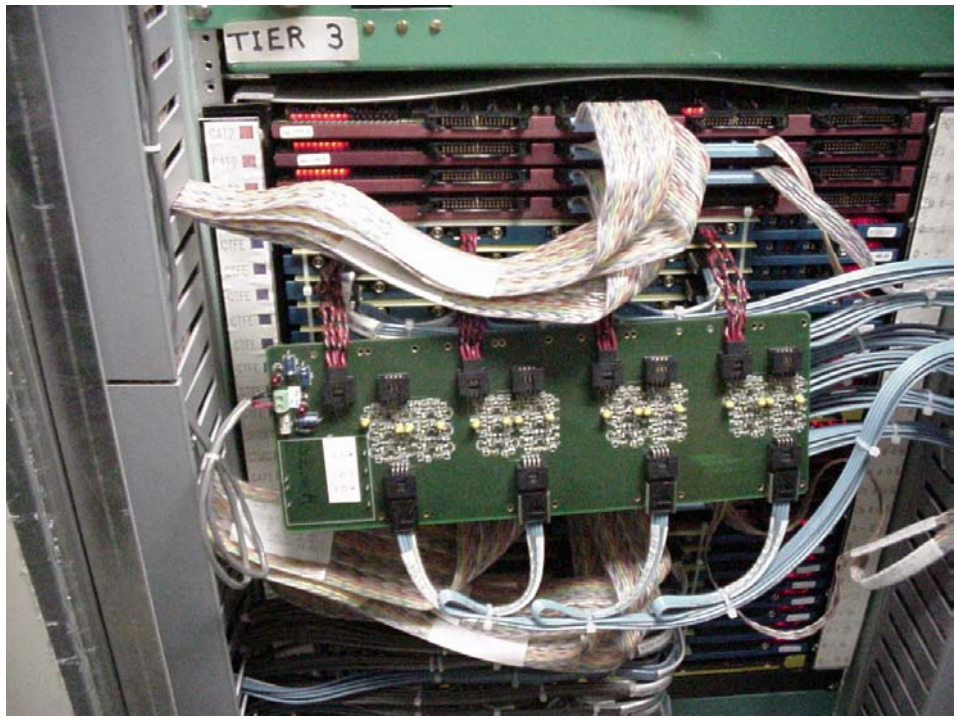


Calorimeter Trigger Status

- ADF prototype schematics
  - All components chosen
  - Verified in January: end of prototype design phase
- ADF prototype PCB design
  - Layout ~ 25% complete
  - Expect 3-4 weeks to finalize
- TAB design essentially finished
  - Layout/schematics well advanced
  - Recent design issues
    - Use thresholds to deal with digital filter signal truncation
    - ADF-to-TAB cable mapping scheme adopted
      - Density of cables → no room for standard VME backplane
    - Slow communication w/ TABs & GAB designed
      - Full access to TAB/GAB using VME-transparent interface
    - Timing/control signal distribution

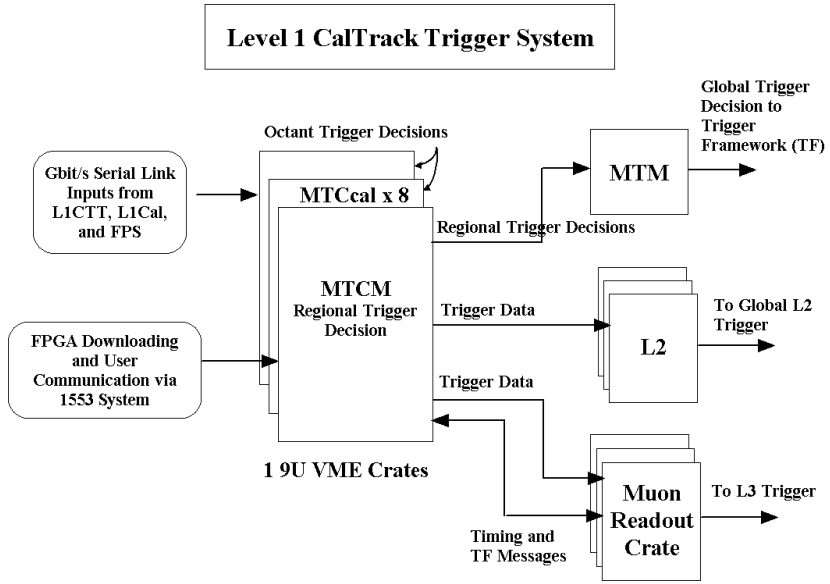
Analog Splitter: Saclay & MSU

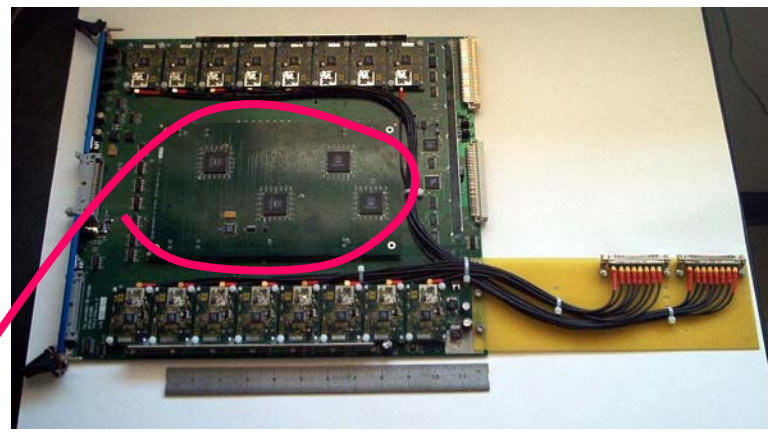
- Analog splitter: allows in-situ test of digital filtering with real signals
  - Designed and tested at Saclay
  - Shipped to MSU Dec 20th: tested there
  - Installed in DØ L1Cal trigger (Run IIa) during current shutdown
  - Noise tests in progress
  - Tests with beam (w/ splitter vs. w/o splitter) to follow



WBS 1.2.2: Cal-Trk Match: Arizona

- Uses "L1mu" electronics, apart from specialized "flavor board"
- Flavor board (MTFB) prototype design >90% complete
- Some procurements anticipated for next month
- Approval was essential for keeping this on track

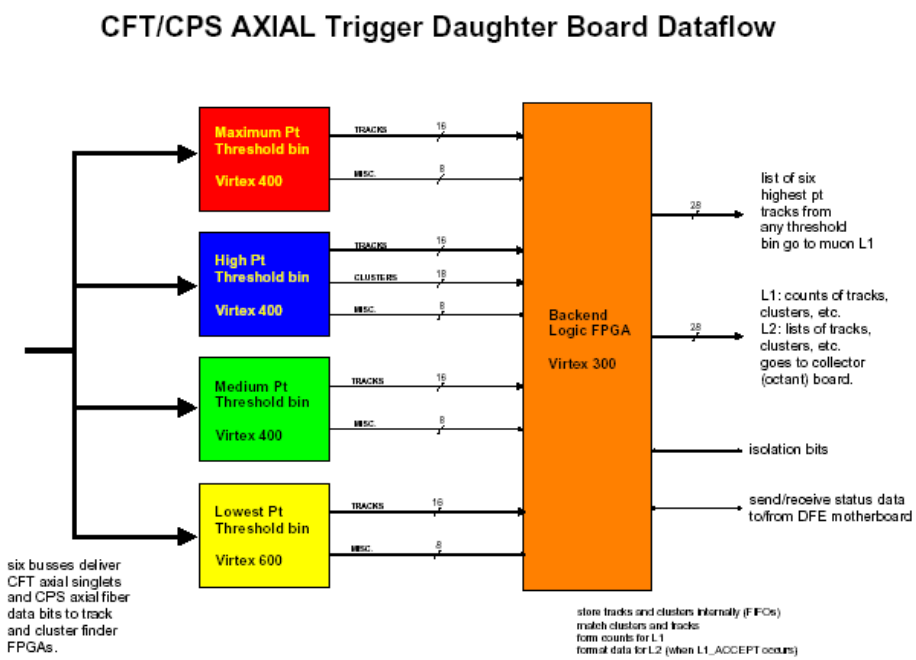




Run IIa MTFB (scint flavor)

L1 CTT: Boston Univ.

- Firmware design for target algorithm began in Nov
- "front end" and "back end" code from Run IIa rewritten – latency reduced
- Ongoing work on maps of single fibers



Level 1 Trigger Upgrade

- **Laboratory guidance for Run IIb:**
  - Design for instantaneous luminosity of 2E32, bunch spacing of 396 nsec (leveling)
  - Allow for factor 2 headroom in luminosity (4E32)
  - BD suggesting they will "do no further work" toward 132 nsec operation. Final decision forthcoming.

Trigger	Example Physics Channels	L1 Rate (kHz) (no upgrade)	L1 Rate (kHz) (with upgrade)
EM (1 EM TT > 10 GeV)	$W \to e\nu$ $WH \to e\nu jj$	1.3	0.7
Di-EM (1 EM TT > 7 GeV, 2 EM TT > 5 GeV)	$Z \to ee$ $ZH \to eejj$	0.5	0.1
Muon (muon p_T > 11 GeV + CFT Track)	$W \to \mu\nu$ $WH \to \mu\nu jj$	6	0.4
Di-Muons (2 muons p_T > 3 GeV + CFT Tracks)	$Z \to \mu\mu$, $J/\Psi \to \mu\mu$ $ZH \to \mu\mu jj$	0.4	< 0.1
Electron + Jets (1 EM TT > 7 GeV, 2 Had TT > 5 GeV)	$WH \to e\nu$+jets $tt \to e\nu$+jets	0.8	0.2
Muon + Jet (muon p_T > 3 GeV, 1 Had TT > 5 GeV)	$WH \to \mu\nu$+jets $tt \to \mu\nu$+jets	< 0.1	< 0.1
Jet+MET (2 TT > 5 GeV, Missing E_T> 10 GeV)	$ZH \to \nu\bar{\nu}b\bar{b}$	2.1	0.8
Muon + EM (muons p_T > 3 GeV+ CFT track + 1 EM TT > 5 GeV)	$H \to WW, ZZ$	< 0.1	< 0.1
Single Isolated Track (1 Isolated CFT track, p_T > 10 GeV)	$H \to \tau\tau$, $W \to \mu\nu$	17	1.0
Di-Track (1 isolated tracks p_T > 10 GeV, 2 tracks p_T > 5 GeV, 1 matched with EM energy)	$H \to \tau\tau$	0.6	<0.1

← **Core Run IIb trigger menu, simulated at 2E32, 396 ns**

Total output rate with (without) L1 trigger upgrade = 3.2 (~30) kHz

Available L1 bandwidth budget: 5 kHz

Not quite factor of 2 headroom (simulations, on paper)

Verification with data ongoing

Simulation

- Studies of effects of trigger tower thresholds on L1cal global sums (missing E_T)
- L1Cal tau algorithm included in trig sim
- Output of Run IIb L1 cal interfaced to standard DØ framework simulation package
- Simulation of Cal-track matching progressing
- CTT as-built geometry and beam offsets incorporated into simulation
  - Beam offsets up to ~1 mm to not affect efficiency of Run IIb equations

Run IIb Workshops

Organized by WBS L2 Managers

- Calorimeter Trigger Workshop held Nov 4-6, Saclay
  - Participants: Engineers & physicists from Saclay, Columbia, MSU, Brown, NeU
  - Many decisions made about ADF-TAB data transfer, system commissioning
  - ADF + TAB prototype integration tests scheduled at Fermilab this summer
  - Further delineation of institutional commitments
- Silicon Workshop held December 12-13, Fermilab – Goals:
  - Inner & outer layer sensors: status, vendors (ELMA, HPK), specs, measurements, etc.
  - Establish stave core dimensions, stave grounding scheme
  - Overall detector mapping scheme, physical parameters of adapter card, junction card region, physical constraints in inter-cryostat gap
  - Low voltage regulation, design
  - Further develop plan for hybrid production and testing
- Workshops being used as efficient means of obtaining convergence on design choices, specs

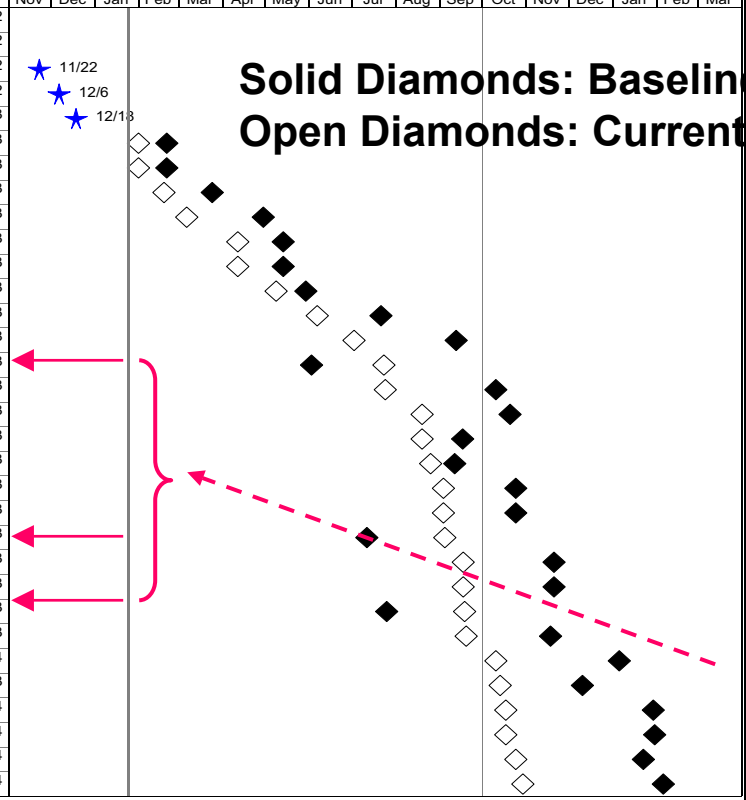
Project Tools, Schedule Tracking

- Overhead in Project Office far more demanding than in past
- Schedule primary tool for keeping project on track
  - Formally "statused" each month within project, results brought back to project personnel
  - Technical progress, costs (labor, equipment), time progress, contingency, overhead all must be accurately and efficiently accounted for
- Critical portion of the project effort:
  - Schedule-driven nature of project demands improved performance
  - Climate, oversight far more intense
  - Failure to come in on schedule, budget will result in gradual loss of PM's body parts
- Fast turn around essential; in final throes of putting tools together that will allow us to realize this
- Goal is to continuously reassess project plan, altering logic or approaches to technical schemes in order to exploit time available, ameliorate delays

Silicon Milestones – One Year Window

Run IIb Silicon Milestones
(1 Year Window 11/02-10/03)

ID	Name	Forecast	Baseline
136	First Chip Ready For Hybrid	7/8/02	7/8/02
446	Successful Readout of Hybrid With SASEQ Test Stand	8/1/02	8/1/02
437	Successful Readout Of More Than 1 Silicon Hybrid	11/22/02	12/5/02
15	Sensor Probing Equipment Setup And Certification Complete	12/6/02	11/14/02
565	Silicon Prototype Mechanical Stave Built	12/18/02	1/6/03
33	Choose L0 Silicon Sensor Technology	1/31/03	2/20/03
69	Choose L1 Silicon Sensor Technology	1/31/03	2/20/03
91	L2-L5 Silicon Sensors Released For Production	2/18/03	3/24/03
262	Silicon L2-L5 Digital Jumper Cables Released For Production	3/6/03	4/29/03
38	L0 Silicon Sensors Released For Production	4/11/03	5/13/03
70	L1 Silicon Sensors Released For Production	4/11/03	5/13/03
399	Silicon High-mass Cables Ready	5/8/03	5/29/03
846	Silicon Cylinders Released for Production	6/6/03	7/21/03
237	Silicon L0 Flex Cables Released For Production	7/2/03	9/12/03
996	Release Silicon Unpacking And Translation Packages	7/23/03	6/2/03
800	Successful Fabrication of an Electrical-grade Pre-production Silicon Stave	7/24/03	10/10/03
138	SVX4 Released For Production	8/19/03	10/20/03
679	Begin 20cm Gang Production	8/20/03	9/17/03
1006	Release Silicon Event Display Package	8/25/03	9/11/03
41	1st L0 Silicon Sensor Delivered	9/3/03	10/24/03
71	1st L1 Silicon Sensor Delivered	9/3/03	10/24/03
1001	Release Silicon Examine Package	9/4/03	7/11/03
194	Silicon L1 Hybrids Released For Production	9/17/03	11/20/03
358	Silicon SASEQ Test Stands Ready	9/17/03	11/20/03
451	Successful Readout Of Silicon Single-unit Full-chain	9/18/03	7/25/03
97	25% L2-L5 Silicon Sensors Delivered And Tested	9/19/03	11/18/03
147	Silicon L0 Hybrids Released For Production	10/10/03	1/5/04
225	Silicon L2-L5 Hybrids Released For Production	10/13/03	12/10/03
439	Successful Readout Of Full Silicon Stave	10/17/03	1/29/04
587	Stave Shells For South Silicon Complete	10/17/03	1/30/04
250	Silicon L0-L1 Digital Jumper Cables Released For Production	10/24/03	1/22/04
137	SVX4 Wafers Delivered	10/29/03	2/5/04



Project: Run IIb Silicon Schedule
Status Date: 12/31/02
Print Date: 1/24/03

Current Forecast ◇ Baseline Milestone ◆ Completed Milestone ★

Page 1 of 1

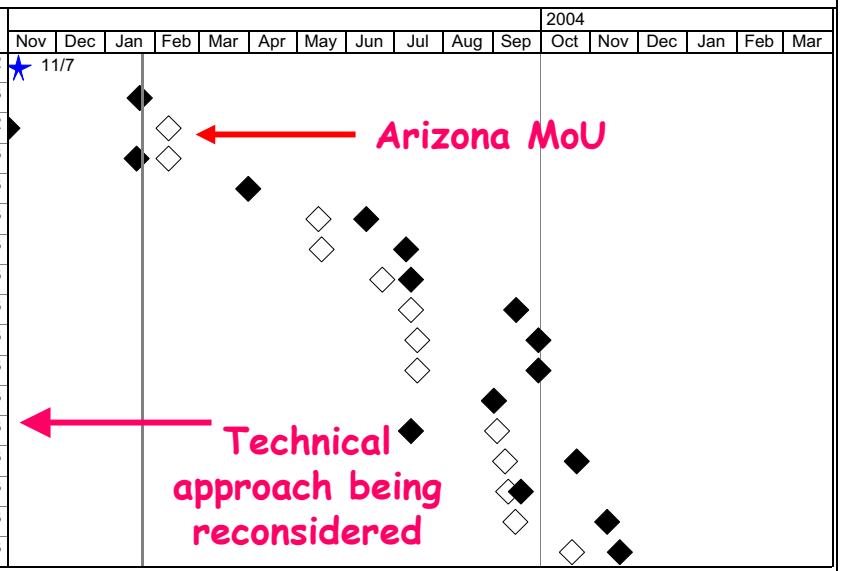
Insufficient software personnel, has been addressed

Trigger/Online Milestones – One Year Window

Solid Diamonds: Baseline
Open Diamonds: Current Forecast

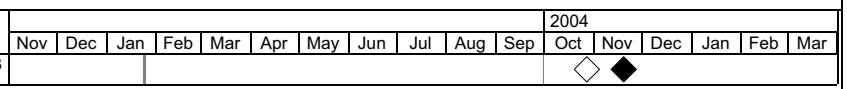
Run IIb Trigger Milestones
(1 Year Window 11/02-10/03)

ID	Name	Forecast	Baseline
164	Prototype L1 Central Track Trigger Algorithm Coded And Simulated With FPGA Sir	11/7/02	11/12/02
109	D0 Internal Design Review Complete	1/23/03	1/23/03
112	L1 Trigger Cal-Trk Match R&D MOU (UAZ) Complete	2/10/03	11/1/02
113	L1 Trigger Cal-Trk Match Equipment MOU (UAZ) Complete	2/10/03	1/21/03
265	Place Parts Orders for L2 Silicon Track Trigger	4/1/03	4/1/03
140	Fabrication and Assembly of L1 Trigger Cal-Trk Match Prototype MTFB Complete	5/14/03	6/13/03
49	L1 Calorimeter Trigger TAB Prototype Complete	5/16/03	7/8/03
9	Prototype L1 Calorimeter Trigger ADF Shipped To Fermilab	6/23/03	7/11/03
168	Target L1 Central Track Trigger Algorithm Firmware Coded And Simulated With FP	7/11/03	9/15/03
67	L1 Calorimeter Trigger GAB Prototype Complete	7/15/03	9/29/03
86	L1 Calorimeter Trigger TAB/GAB Prototyping Complete	7/15/03	9/29/03
268	L2 Silicon Track Trigger Run IIb Inputs Finalized	9/2/03	9/2/03
35	L1 Calorimeter Trigger ADF+Crate Prototype Complete	9/3/03	7/11/03
145	Fabrication and Assembly of L1 Trigger Cal-Trk Match MTFB's Complete	9/8/03	10/23/03
122	Fabrication and Assembly of L1 Trigger Cal-Trk Match Preproduction MTCxx Comp	9/10/03	9/18/03
289	VTM Production Complete for L2 Silicon Track Trigger	9/15/03	11/11/03
132	Fabrication and Assembly of L1 Trigger Cal-Trk Match MTCM's Complete	10/20/03	11/19/03



Run IIb Online/DAQ Milestones
(1 Year Window 11/02-10/03)

ID	Name	Forecast	Baseline
124	DAQ HOST Secondary System Active	10/27/03	11/19/03



Overview of DOE Level 2/ Director's Milestones

L2/Director's Milestones vs Current Forecast

(Sorted by L2/Director's Milestone Date)

Milestone Description	L2/Director Baseline (12/02)	Last Month' Forecast (11/02)	This Month' Forecast (12/02)	L2/Director's Monthly Variance (work days)	Notes
WBS 1.1 Silicon Tracker					
Silicon Prototype Mechanical Stave Built	01/06/03	12/16/02	12/18/02	(6)	2 Complete
L2-L5 Silicon Sensors Released For Production	03/24/03	03/12/03	02/18/03	(24)	(16)
SVX4 Released For Production	10/20/03	07/10/03	08/19/03	(43)	28
Successful Readout Of Full Silicon Stave	01/29/04	11/10/03	10/17/03	(64)	(16)
Silicon Module Production Begun	05/17/04	02/16/04	02/16/04	(65)	0
All Silicon Sensors Delivered And Tested	12/09/04	08/18/04	07/28/04	(93)	(15)
All SVX4 Chips Produced And Tested	12/21/04	05/21/04	07/01/04	(119)	29
All Silicon Hybrids Produced And Tested	03/03/05	08/30/04	10/08/04	(94)	29
Silicon Stave Production Begun	03/08/05	09/13/04	10/21/04	(88)	28
Silicon Module Production And Testing Complete	07/22/05	01/10/05	02/18/05	(108)	29
Downstream Silicon Readout Ready for Installation On Platform	11/25/05	03/09/05	04/18/05	(133)	28
Silicon Stave Production Complete	12/22/05	05/13/05	06/23/05	(126)	29
South Silicon Complete	02/10/06	07/21/05	07/26/05	(132)	3
North Silicon Complete	05/04/06	08/23/05	10/03/05	(143)	29
Silicon Ready To Move To DAB	05/25/06	09/12/05	10/20/05	(145)	28
WBS 1.2 Trigg					
L1 Trigger Cal-Trk Match Production and Testing Complete	03/23/04	07/14/04	07/30/04	(38)	12
L2 Silicon Track Trigger Production and Testing Complete	10/17/05	12/08/04	12/08/04	(212)	0
L1 Calorimeter Trigger Production And Testing Complete	01/05/06	03/28/05	03/28/05	(191)	0
L2 Beta Trigger Production And Testing Complete	01/05/06	02/28/05	02/28/05	(211)	0
L2 Trigger Upgrade Production and Testing Complete	01/05/06	02/28/05	02/28/05	(211)	0
L1 Central Track Trigger Production And Testing Complete	01/10/06	03/10/05	03/10/05	(206)	0
L1 Trigger Upgrade Production and Testing Complete	01/10/06	03/28/05	03/28/05	(194)	0
WBS 1.3 Online/DA					
Online System Production and Testing Complete	10/07/05	06/17/05	06/17/05	(78)	0

status date: 12/31/2002

SVX4

Some Near-Term Silicon Milestones

Six Major Upcoming Silicon Milestones	Project Target Date	Current Forecast	Baseline Date	Comments
Silicon Prototype Mechanical Stave Built	12/16/03	12/18/03	1/6/03	Major integration milestone – was met
L2-L5 Sensors Released for Production	2/11/03	2/18/03	3/24/03	Further delays expected; characterizing sensors. Should not extend to baseline date.
SVX4 Released for Production	7/10/03	8/19/03	10/20/03	Excellent performance of initial prototype
Successful Fabrication of Electrical-Grade Pre-Production Silicon Stave*	7/17/03	7/24/03	10/10/03	Major integration milestone
Successful Readout of Full Silicon Stave	10/10/03	10/17/03	1/29/04	Major integration milestone
Silicon Module Production Begun	2/16/04	2/16/04	5/17/04	Remains on track

* Not a DOE L2/Director's Milestone

Forecasts remain well ahead of baseline dates

Some Near-Term Level 1 Trigger Milestones

Five Major Upcoming Silicon Milestones	Project Target Date	Current Forecast	Baseline Date	Comments
L1 ADF shipped to Fermilab	5/2/03	6/23/03	7/11/03	Saclay designing, fabricating L1 cal front-end
L1 Calorimeter Trigger TAB/GAB Prototype Complete	7/16/03	7/15/03	9/29/03	Columbia/Nevis
ADF+TAB Prototype Integration	7/17/03	7/16/03	9/30/03	Major integration milestone: in-situ integration summer '03
L1 CTT Algorithm Firmware Coded & Simulated with FPGA Simulation Tools	7/17/03	7/11/03	9/15/03	First major L1 CTT milestone
Fabrication & assembly of L1 Trigger Cal-TRK Match MTCM complete	10/20/03	10/20/03	11/10/03	Completion of production; based on current muon trigger cards

Level 2 trigger, online begin later

Forecasts remain well ahead of baseline dates

Production Readiness Reviews (PRR)

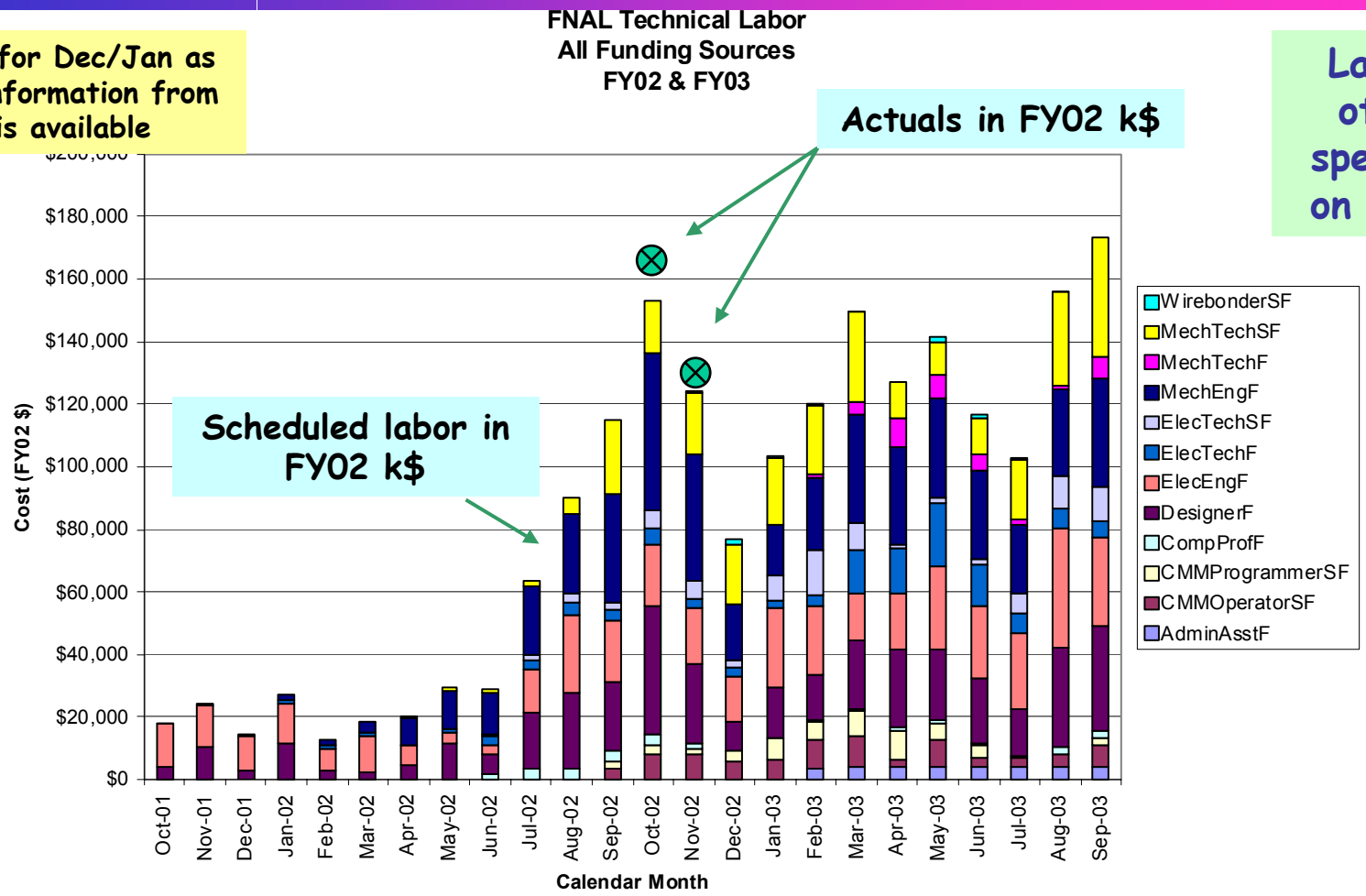
- Dates for such reviews embedded in schedule as a critical element nears production (~ 25 throughout project)
- Process required before equipment money is signed off for construction by Project Manager
- Provides focus, concrete time scales, independent assessment of technical approach, project-wide dissemination of specs, etc.
- First review: "Purple Card" - sequencer/hybrid interface PC card – held 1/30/03. Committee:
  - C. Gerber (UIC), J. Green (Fermilab), K. Hanagaki (Fermilab), S. Lager (Stockholm), R. Lipton (Fermilab, Chair), R. Sidwell (KSU)
  - Report submitted – ready to go
- Next review: Outer layer silicon sensors, 3/6-7/03. Committee:
  - N. Bacchetta (PISA), B. Gobbi (NWestern), J. Ellison (UCR, Chair), R. Lipton (Fermilab), H. Sadrozinski (UCSC), S. Worm (Rutgers)
  - $1.5M order with Hamamatsu

Upcoming Production Readiness Reviews

Upcoming Production Readiness Reviews		
(Sorted by Current Forecast Date)		
Description	**Forecast Review Date**	**Notes**
WBS 1.1 Silicon Tracker		
Purple Card PRR	01/09/03	Completed 01/30/03
Readiness Review for L2-L5 Silicon Sensors	02/18/03	Scheduled for 03/06/03
Readiness Review for L1 Silicon Sensors	02/18/03	Partial review 03/06/03
Readiness Review for L0 Silicon Sensors	04/11/03	Partial review 03/06/03
Production Readiness Review for L0 Analog Cable	06/04/03	
Production Readiness Review for L0/L1 HV System	07/18/03	
Production Readiness Review for L0/L1 Mechanical Support Design	07/14/03	
Readiness Review for Interface Board Crate Backplane	08/08/03	
Readiness Review for Low Voltage System	08/08/03	
WBS 1.2 Trigger		
L1 Trigger Cal-Trk Match MTCxx, MTCM and MTFB	06/02/03	

Labor Cost Extracted from Schedule vs. Actuals (R&D)

Updated for Dec/Jan as soon as information from PPD is available



Labor, other spending on track

Actuals: Oct = $168.5k, Nov = $132.8k (FY03 k$)
No contingency or G&A in schedule prediction
Agreement quite good, but earned value is real measure (actuals, COBRA)

Run II Beyond 2003

(S. Holmes' slide from Feb '03 AAC, initially shown at Oct '02 DOE Review)

- Intention is to define scope and projectize as a direct follow-on to the FY03 plan, starting after this review
- A reasonable range of goals based on our current experience would be:

Fiscal Year	Base Goal (fb^{-1}/yr)	Stretch Goal (fb^{-1}/yr)	Integrated Base Goal (fb^{-1})	Integrated Stretch Goal (fb^{-1})
FY02	0.08	0.08	0.08	0.08
FY03	0.2	0.32	0.28	0.4
FY04	0.4	0.6	0.68	1.0
FY05	1.0	1.5	1.68	2.5
FY06	1.5	2.5	3.18	5.0
FY07	1.5	3.0	4.68	8.0
FY08	1.8	3.0	6.5	11.0

Issues/uncertainties:

Long-range beam-beam
Recycling
Funding (FY03…)
Electron cooling
132 nsec operations
NuMI operations

Nominal shutdown for detectors: mid-FY06

More extensive project plan being developed by BD for June '03 DOE Review

Performance Goals

(from talk by J. Spalding, Feb '03 AAC)

Compared to now
x1.5 ➡
x5 ➡

x3.5
x5.7 ➡

	Typical Run Ib	Store 1953	Goal: FY03	Run II Target	
Peak Luminosity	1.6	3.7	6.6	33.0	$x10^{31} cm^{-2} sec^{-1}$
Integrated Luminosity	3.1	6[(1)]	12.0	70.0	pb^{-1}/wk
Store hours per week	84	86[(1)]	81[(3)]	98	
Interactions/crossing	2.5	1.0	1.7	8.5	
Pbar Bunches	6	36	36	36	
Form Factor	0.59	0.60	0.63	0.63	
Protons/bunch	23.0	16.3	24.0	27.0	$x10^{10}$
Pbars/bunch	5.6	2.5	3.1	13.5	$x10^{10}$
Total pbars	33.6	91.0	113.0	486.0	$x10^{10}$
Peak Pbar Prod. Rate	7.0	11.5[(2)]	18.0	45.0	$x10^{10}/hr$
Avg. Pbar Prod.Rate	4.2	6.9	11.0	40.0	$x10^{10}/hr$
Pbar Transmission Eff.	50	60	80	85	%
Stack Used	67	152	141[(4)]	572	$x10^{10}$
β*	35	35	35	35	cm
MI extraction Long.Emit.		3.5	2.5	2.5	eV s
Bunch Length (rms)	0.6	0.6	0.54	0.54	m
Proton Emittance (at coll)	23	19	20	20	π-mm-mrad
Pbar Emittance (at coll)	13	14	15	14	π-mm-mrad
Store Length	16	22	15	9	hr

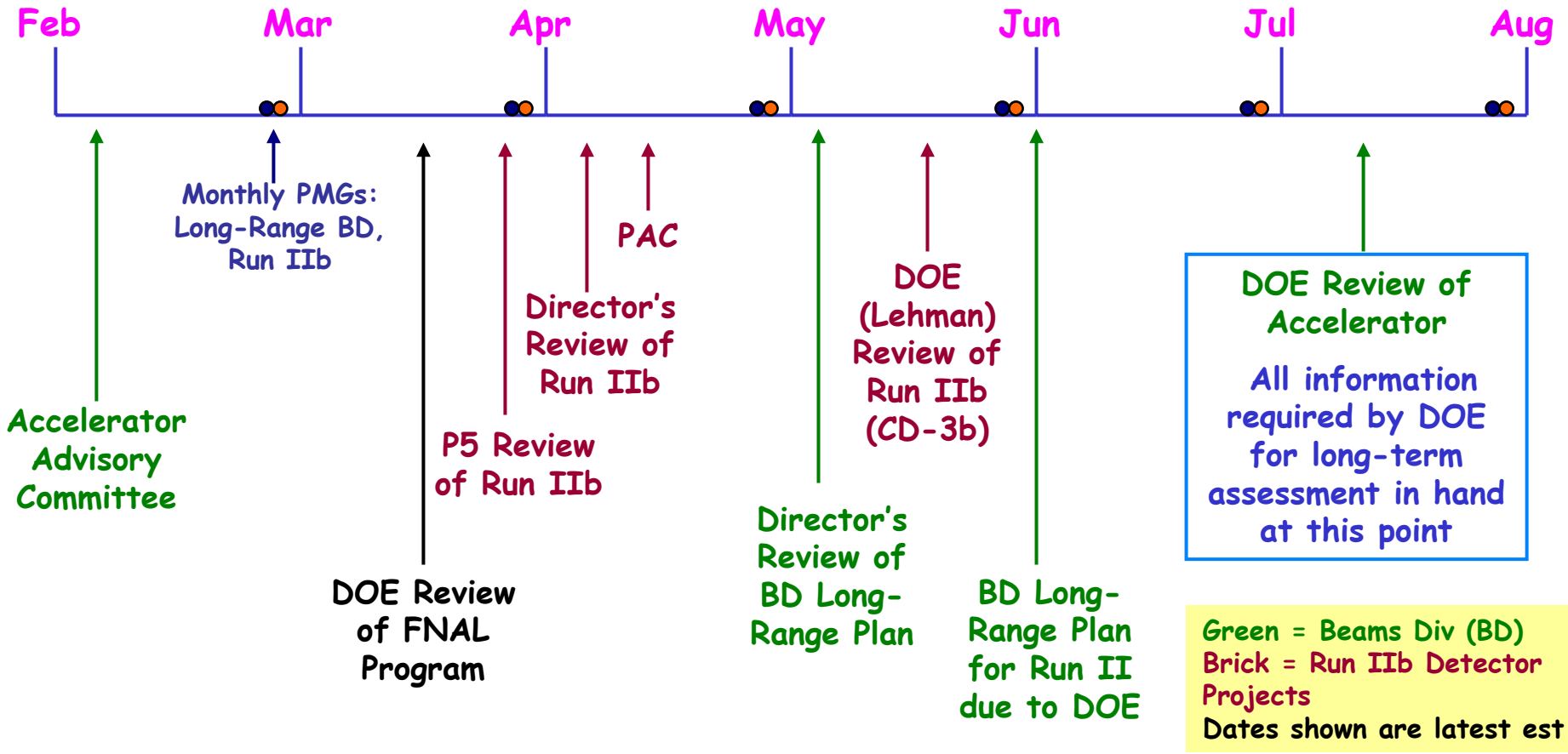
(1) typical for Dec-Jan 03 (other numbers in this column are for store 1953)

(2) best stacking rate achieved $13.1x10^{10}/hr$

(3) excluding studies

(4) additional pBar stack used for RR commissioning

Keeping Run II(b) on the Map: Next Six Months



Green = Beams Div (BD)
Brick = Run IIb Detector Projects
Dates shown are latest est

- Experiments now directly participating in BD planning. Comes with a price:
  - Reviews (both sides of table), associated preparation quite extensive
- Above demonstrates impact of current climate, + compressed schedule
  - Heavy emphasis on project management at all levels

Collaboration Commitment to Run II(b)

- At October '02 DOE Accelerator Review, Fermilab announced its intention to "eliminate Run IIa, IIb distinction and manage (Tevatron performance) as an integrated whole."
- DZero beginning to follow suit, but slowly…
- Must install, commission, and be physics-ready on time scales that ensure the relevance of our program prior to turn-on of LHC
- Hardware/project per-se is only part of the story: downstream functionality must be simultaneously developed in order to come up in physics-ready state post-shutdown
  - Databases, filtering, online systems/software, monitoring, reconstruction, firmware iterations, feedback to hardware, …
  - In addition to silicon production/testing shifts
- Project, Laboratory plan currently provides for:
  - Short shutdown (7 months), nominally beginning in three years
  - Few months for beam commissioning
  - Physics-quality data within one year after shutdown start
- Will require major commitment from Collaboration as a whole

Conclusions

- Upgrade continues to make excellent technical progress
- Spending approval last week a big boost - critical ingredient for keeping project on track
- Project tools continually being developed and sharpened – goal is to provide rapid feedback to project, reconsider course to realize schedule gains, where possible
- Run IIb detector project plan has been continuously and deeply vetted by community prior to baselining over past 18 months. Primary focus now is delivering on our commitments.
- **Are working with Laboratory and Beams Division in every way possible to develop a solid plans for the full complex, maximize Run II physics potential.**